

# **LESSONS LEARNED FROM IN-FIELD EVALUATIONS OF PHASE I MUNICIPAL STORM WATER PROGRAMS**

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## **Abstract**

Tetra Tech is assisting EPA in the evaluation of a number of storm water Phase I MS4 permit programs in California and selected other States. These evaluations consist of two components: a programmatic review of individual city and county programs implementing permit requirements and an on-site/in-field verification of these program elements. This in-field verification allows EPA and the State to assess whether a program is actually being implemented as described 'on paper.' The overall goals of these evaluations are to complete a baseline assessment of each program area, determine compliance with permit requirements and the stormwater management plan, collect information for permit reissuance, and determine how municipalities measure program effectiveness. In addition, the 'lessons learned' from these evaluations can be directly applied by many of the Phase II jurisdictions, which will begin permit coverage in March 2003.

## **Introduction**

On November 16, 1990, the U.S. Environmental Protection Agency (EPA) published regulations (the 'Phase I rule') requiring National Pollutant Discharge Elimination System (NPDES) permits for certain industrial, construction and municipal sources of storm water runoff fundamentally changing the way storm water runoff is regulated at the State and Federal levels. Approximately 1,000 MS4s ('municipal separate storm sewer systems'), consisting primarily of City and County government agencies responsible for storm water, have been permitted under the Phase I regulations. The Phase I MS4 regulations generally require MS4s to reduce discharges of pollutants to the maximum extent practicable and to prohibit illicit discharges to the MS4. Specific elements in a Phase I Municipal Storm Water Management Program include public education, public agency or municipal maintenance activities, new development, construction, industrial/commercial facilities, illicit discharges and improper disposal, monitoring and reporting.

Phase II of the storm water program, established in 1999, extends the coverage to include municipalities within urbanized areas and all construction disturbing at least one acre. Permits for these Phase II sources, which will include over 5,000 additional MS4s, are scheduled to become effective on March 10, 2003. Phase II Municipal Storm Water Management Programs are required to address public education, public involvement, illicit discharges, construction, new development, and municipal operations.

Although many Phase I MS4 permits are in their second or third permit cycle, EPA has not yet completed a comprehensive compliance assessment of these MS4 permits. A General Accounting Office report published in June 2001 (GAO, 2001) found that neither the overall costs of implementing the storm water

program nor the program's effectiveness had been determined. This GAO report followed an EPA report on the Phase I storm water regulations (EPA, 2000) that found many effective Phase I program components, but admitted that EPA did not have a system in place to comprehensively measure the success of the Phase I program on a national scale.

## **Storm Water Phase I MS4 Evaluations**

EPA Region IX hired Tetra Tech, Inc. in 2001 to begin a series of MS4 evaluations in the State of California to assess the compliance status of individual storm water Phase I MS4 permittees. In order to assess on-the-ground implementation of the programs, these program evaluations are conducted on-site. The on-site evaluation consists of two components: a programmatic review of individual MS4 programs implementing permit requirements and an in-field verification of these program elements. This in-field verification allows EPA and the State to assess whether a program is actually being implemented as described 'on paper.'

The project goals of the on-site MS4 evaluations include obtaining an overall picture of MS4 compliance, documenting effective elements of existing Phase I programs, identifying methods to improve MS4 program reporting, and developing a guidance document to assist State and/or EPA inspectors in conducting future MS4 evaluations.

Determining compliance with MS4 permits is in many cases subjective. Unlike some other environmental programs such as the pretreatment program, there is no checklist, list of BMPs, or objective criteria that all MS4s need to meet. In addition, EPA has not defined 'maximum extent practicable' or MEP which is the regulatory standard that MS4s must meet. This leaves it up to individual permit writers to define for each MS4 permit. Therefore, the MS4 inspectors have been using their best professional judgment and experience to identify program elements that are 'effective' or 'deficient.'

The MS4 on-site evaluations conducted to date have typically consisted of a 3-4 day on-site review. This on-site review has been conducted on a single MS4, and has also included multiple co-permittee MS4s evaluated with up to three investigators. For each of the MS4s evaluated, a number of staff from multiple departments were typically involved. Typical departments involved in the MS4 evaluations included public works, transportation, planning, development, and parks/recreation. As of December 2002, 14 MS4 evaluations have been conducted in EPA Region IX, covering 41 separate permittees.

The MS4 inspectors typically do not review or make recommendations on financial resources. Where a program element is clearly not being implemented to the maximum extent practicable – for example, when compliance with local construction erosion and sediment control requirements is poor due to lack of inspections – that will be noted as a deficiency. The MS4 inspectors will suggest improvements to the program so resources can be used for effectively, but responding to those suggestions or how to resolve the identified deficiencies is up to each individual MS4.

A wide variety of storm water permits, storm water management programs, and compliance with those permits and programs were found during the evaluations. However, some common trends were observed as indicated in the following sections. The trends and evaluation findings are grouped into the broad categories of program management/planning, implementation, and evaluation.

## **Program Management/Planning Findings**

A clear, well-written permit and plan are critical for successful implementation of a storm water management program. This requires the permitting authority to describe the required actions clearly in a permit and the permittee to clearly articulate how it will meet these requirements in a storm water plan. The Phase I MS4 evaluations conducted by Tetra Tech have found that the more advanced storm water programs generally have more detailed, well-written permits and plans. Several findings common to most of the programs evaluated are described below.

### **NPDES MS4 permits and MS4 stormwater management programs need to contain quantifiable, measurable elements so compliance can be determined.**

Storm water permits vary significantly in their level of detail. Some third-term permits issued in California contain very specific, measurable elements which are clear for the permittee to implement and relatively straightforward for the State to determine compliance. For nonspecific permits that simply require the MS4 to “implement a storm water management plan,” determining compliance becomes more difficult. More importantly, the permit does not specify, or measure, the level of effort expected, so MS4s do not have a clear target to achieve.

The storm water Phase II regulations require small MS4s to develop “measurable goals” for each BMP in their program. These measurable goals are intended to provide a quantifiable target for the MS4s to achieve in the implementation of that BMP. Although a similar requirement does not specifically exist for Phase I, permits and programs developed under Phase I should begin to include these measurable goals. For example, the permit and program should specify the number of industrial inspections expected per year and the number of catch basins that should be inspected and cleaned. This provides a level of certainty to the MS4 that they are successfully implementing the permit and allows the State to more easily evaluate compliance.

Some MS4 permits in California are including specific, measurable requirements that make determining compliance easier. Also, the City and County of Sacramento have developed stormwater plans that are clear, well-written, and begin to address the issue of measurable goals which are called ‘minimum performance standards’ and ‘performance and effectiveness measures’, respectively, in each plan (City of Sacramento, 2000 and County of Sacramento, 2000).

### **Programs are not designed to specifically address pollutants of concern.**

The primary goal of programs under the Clean Water Act is to achieve fishable, swimmable waters by meeting water quality standards. Many MS4 programs are not designed to address the specific pollutants of concern already identified in their watershed. Where pollutants of concern have been identified, MS4 programs should be modified to include BMPs and programs that specifically target a reduction in these pollutants.

Some Phase I programs in California are developing plans to address identified pollutants of concern in their community, including those pollutants identified on the State’s Section 303(d) list. Pollutants of concern can also be identified from local studies or watershed research. Several programs, including programs in Alameda County and Sacramento County, have developed strategies to more specifically target and reduce pollutants of concern. For example, Sacramento County is developing a series of Target Pollutant Reduction strategies to focus some program resources on pollutants that cause or are likely to cause impairments in local receiving waters. Target pollutants for the Sacramento area include diazinon,

chlorpyrifos, coliform/pathogens, copper, and lead. Sacramento County still implements baseline activities, but uses the target pollutant reduction strategies to ensure activities are developed to address specific pollutants.

**Combining resources and expertise into a committee can save MS4s time and money.**

Many MS4s that have been permitted together have joined resources in a committee structure. This sharing of resources and experience can help all participating MS4s by more efficiently developing public education materials, guidance, standard forms and other materials for all of the MS4s to use. Also, for smaller MS4s with more limited budgets, the committee structure provides assistance these MS4s may not have been able to otherwise obtain, such as use of a centralized database for entering and managing reporting information. Examples of storm water management committees can be found in several California counties, including Alameda, Sacramento, Ventura, San Diego, and Los Angeles.

## **Implementation Findings**

As the stormwater Phase I program is implemented and matures, Phase I MS4s are continuing to struggle with the implementation of several common aspects of the program. On-the-ground activities such as inspections of construction sites and industrial facilities appear to be a common problem, while other programs like public education and municipal maintenance are often more advanced. Below are several of the common findings associated with implementation of the storm water Phase I program.

**Compliance with local construction site erosion and sediment controls is a challenge for all MS4s.**

Storm water Phase I regulations require MS4s to develop a local program to control construction site runoff. Many MS4s, however, find this program a challenge to implement. The frequency of inspections at construction sites required to ensure proper installation and maintenance of erosion and sediment control BMPs is often lacking. Some MS4s count all inspector visits to construction sites, even inspectors who have nothing to do with erosion and sediment controls. Also, some MS4s have different requirements for public and private construction sites. All of these factors can contribute to a program that is ineffective in preventing erosion and sediment control problems at construction sites.

Tetra Tech has found that successful programs often have dedicated erosion and sediment control inspectors for local construction projects. These inspectors are involved in not only inspections, but also participate in the plan review process so they are aware of what erosion and sediment controls and post-construction BMPs the construction sites are required to implement. Also, these inspectors have adequate enforcement mechanisms such as stop work authority or the ability to fine contractors to ensure compliance.

**Local MS4 industrial and construction inspectors are often unaware of State permit requirements.**

The State of California, like all states, has issued statewide general permits for controlling storm water runoff from industrial facilities and construction activity. Within Phase I areas, however, industrial facilities and construction operators also need to comply with the local MS4 program to address industrial or construction runoff. Many local inspectors, although they are trained in the local requirements, are often unaware of the requirements contained in the statewide permit. In some cases this is intentional, as the MS4 does not want the responsibility of enforcing the statewide permit requirements. However, MS4s can provide a valuable service to their local construction and industrial facilities by explaining the difference between the two sets of requirements, and what these facilities need to do to comply with the statewide requirements.

Some programs avoid this problem by simply adopting the statewide permit requirement for a stormwater pollution prevention plan (SWPPP) as their own requirement. This ensures that local construction operators only need to develop one plan to comply with both local and state stormwater requirements, and local construction inspectors only need to know one set of requirements.

**Pretreatment inspectors, if available, can efficiently conduct industrial stormwater inspections.**

The pretreatment program is a well-established program with existing staff trained in water quality practices and enforcement techniques. Some MS4s have expanded the role of pretreatment inspectors to also conduct industrial stormwater inspections. Many of these industrial facilities are already included in the pretreatment program, therefore the on-site inspector simply needs to also include several stormwater elements in their inspections. For MS4s with an existing pretreatment program, this expansion of pretreatment inspector duties to include stormwater inspections effectively implements the program without creating a separate inspection program. Of course, this approach may not be as effective in areas where the sanitary sewer system does not fully coincide with the storm drainage system (e.g., areas on septic systems).

**Many MS4s fail to identify and eliminate dry weather discharges.**

A separate storm drain system is designed to carry only storm water runoff. Dry weather, therefore, presents MS4s an excellent opportunity to identify and eliminate non-stormwater discharges to their storm drain system. The evaluations have found that many MS4s, however, fail to identify and eliminate dry weather discharges. These MS4s either fail to look for any discharges during dry weather, or assume that all dry weather discharges are attributable to landscape irrigation, groundwater infiltration, or some other uncontaminated source.

**Municipal maintenance and spill response programs are often more advanced than other program areas.**

Due to the need to minimize episodes of flooding, MS4s often have effective maintenance programs of their storm drain systems. The municipal maintenance staff are often well trained, equipped, and have detailed records of their maintenance activities. Also, other related programs such as street sweeping, which are often initiated for different reasons (e.g., aesthetics), also have significant stormwater benefits. In addition, for obvious public safety reasons, many MS4s have effective spill response programs.

**Many MS4s have extensive public education programs.**

Public education programs are often an ‘easy’ and ‘fun’ program for MS4s to implement. Many MS4s have been very innovative in finding new methods to reach target audiences. This includes websites, classroom educational programs, radio and TV commercials, mascots, and public involvement programs such as storm drain stenciling programs. Some MS4s have also taken surveys of their residents to determine the overall level of awareness and effectiveness of their public education programs.

## **Evaluation Findings**

As EPA found with its 2000 Report to Congress (EPA, 2000), evaluating the effectiveness of the stormwater program is a difficult task. However, successful programs are developing local measures by which progress or effectiveness can be evaluated, including the use of environmental indicators. Tetra Tech found that many programs share common problems in terms of program evaluation, as described in the findings below.

**MS4 programs are not evaluating their data and are therefore not modifying programs in response to trends in this data.**

EPA envisioned the storm water program to be an iterative process. Storm water permits, and programs, should evaluate what is working and be able to make modifications in response to changing conditions. Many programs, however, are not collecting the data, such as monitoring or other performance and effectiveness data, necessary to determine needed changes.

At a minimum, programs should complete a comprehensive outcome evaluation at the end of each permit term, and should complete an annual process evaluation at the end of each year with the submittal of the annual report. This will ensure that programs are responsive to changing priorities and needs.

**MS4 programs should develop different methods to evaluate the effectiveness of their programs.**

All Phase I MS4s collect monitoring data, but few programs are collecting enough water quality data to show statistically significant changes. Other evaluation techniques, such as environmental indicators, should be considered by these programs as a way to characterize water quality conditions and provide a benchmark for evaluating the success of the stormwater management program. These indicators (Claytor and Brown, 1996) should include a mixture of programmatic indicators, physical and hydrological indicators, biological indicators, social indicators, programmatic indicators and site indicators. Examples include toxicity testing as a water quality indicator and the number of illicit connections identified/corrected as a programmatic indicator. These indicators are important due to the difficulty and expense in documenting water quality improvements solely from water quality monitoring data. Environmental indicators can also be used to ascertain that high quality waters are being maintained or provide an early warning of when their beneficial uses are at risk of being degraded.

**Annual reports provide useful information, but are not always good indicators of program effectiveness.**

The on-site evaluations have revealed that, although annual reports *can* indicate the success of a program, poor programs can hide behind well-written annual reports and some aspects of effective programs can be hidden or missing from annual reports. Because there is not a standardized reporting process for all Phase I MS4s, this allows each MS4 to choose the type of information it wants to present. A knowledgeable report writer can selectively report certain information, such as the total number of municipal inspectors visiting a construction site instead of the number of inspectors specifically evaluating stormwater controls.

The absence of a standardized report could become especially important as the 5,000+ stormwater Phase II MS4s begin to submit annual reports. A consistent reporting format will allow states to compare information collected from MS4s and will also allow EPA to compare reporting results across states.

**Compliance with a permit may not always indicate that a program is successful in protecting water quality.**

There is a significant variability in the requirements within the Phase I MS4 permits, even within the State of California. This variability, along with the iterative nature of stormwater permitting, allows MS4s to operate under different guidelines, and implement different programs. A programs success should be tied not only to meeting permit requirements, but also to meeting water quality goals.

## Conclusions

Before the storm water Phase I program, most municipal storm water programs were primarily designed to address water quantity issues (e.g., minimize flooding). The storm water Phase I program is beginning to mature and learn from mistakes in the past, however a significant amount of work remains in developing guidance or programs to document these lessons. Improved reporting, monitoring, and evaluation techniques are needed, but will likely only be implemented in many programs through changes in NPDES permit requirements.

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